

10/21/22

# SCICOMP301 TOPICS IN COMPUTER SCIENCE

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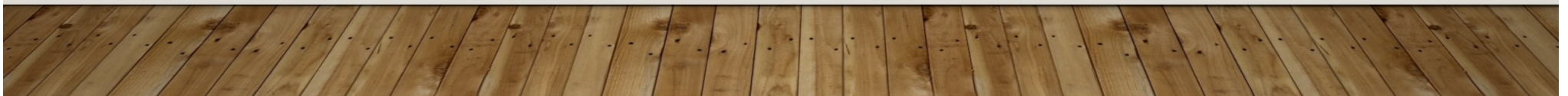
## PROJECT 2 SCHEDULING EXPERIMENTS

MEHRAD HAGHSHENAS

## 2 THEORY

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- **CPU utilization:** A CPU algorithm's goal is to keep the CPU as busy as possible. The percentage of CPU usage is referred to as the CPU utilization. Theoretically it can be 0-100 but in a real-time system, it varies from 40-90.
- **Throughput:** Also referred to as the average CPU performance. It is the number of processes completed per unit.
- **Turnaround time:** The time from the **arrival time** of a process to the **completion** of the process is called the turnaround time. This consists of the time spent waiting for memory access, using CPU, and waiting for I / O.
- **Waiting time:** The time spent in the waiting process in the **ready** queue. This is determined by the scheduling algorithm.



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```
logdir .  
logfn logfile.html  
quiet .  
imagename gifim  
user Local User  
portable true  
run myrun  
exp myexp
```

```
name myrun  
comment This is experiment 1 run file  
algorithm RR 2  
  
numprocs 20  
firstarrival 0.0  
interarrival constant 0.0  
duration constant 24.0  
cpuburst constant 4.0  
ioburst constant 0.0  
basepriority 1.0  
  
numprocs 20  
firstarrival 0.0  
interarrival constant 0.0  
duration constant 6.0  
cpuburst constant 1.0  
ioburst constant 0.0  
basepriority 1.0
```

## EXPERIMENT 1 HYPOTHESIS:

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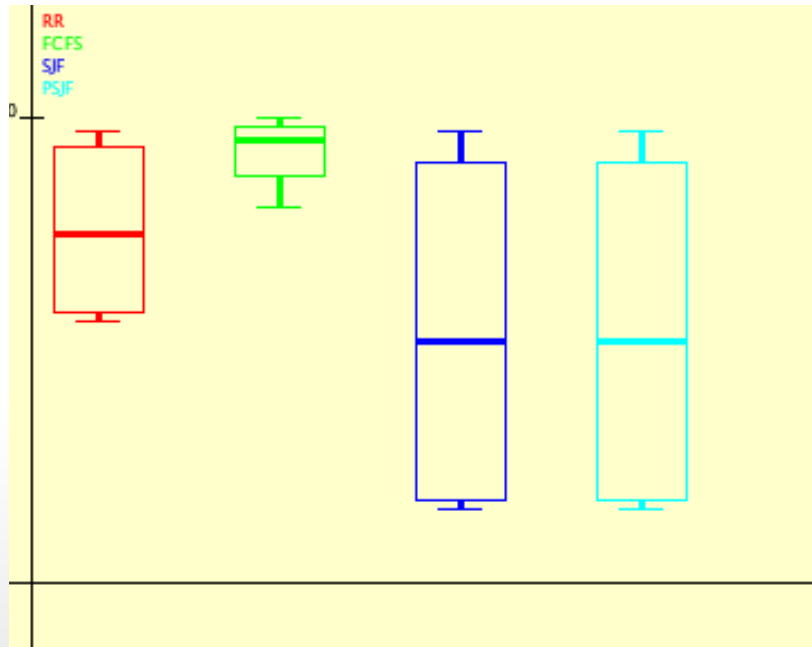
- No difference in results when all distribution values are constant.
- Right: run
- Left: psconfig

## 4 EXP FILE

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```
name myexp
comment This experiment contains 4 runs
run myrun algorithm RR 2 key "RR"
run myrun algorithm FCFS key "FCFS"
run myrun algorithm SJF key "SJF"
run myrun algorithm PSJF key "PSJF"
```

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## BOX PLOTS

- Waiting time:
- $FCFS > RR > SJF = PSJF$

## SJF and PSJF are winners

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6									Entries		Average Time	
Name	Key	Time	Processes	Finished	CPU Utilization	Throughput	CST	LA	CPU	I/O	CPU	I/O
myrun_1	RR	600.00	40	40	1.00000	.066667	0.00	30.05	360	200	1.67	0.00
myrun_2	FCFS	600.00	40	40	1.00000	.066667	0.00	36.75	240	200	2.50	0.00
myrun_3	SJF	600.00	40	40	1.00000	.066667	0.00	21.42	240	200	2.50	0.00
myrun_4	PSJF	600.00	40	40	1.00000	.066667	0.00	21.42	240	200	2.50	0.00

Name	Key	Turnaround Time				Waiting Time			
		Average	Minimum	Maximum	SD	Average	Minimum	Maximum	SD
myrun_1	RR	465.75	341.00	600.00	115.61	450.75	335.00	576.00	2.67
myrun_2	FCFS	566.25	504.00	600.00	29.51	551.25	480.00	594.00	.93
myrun_3	SJF	336.25	101.00	600.00	226.38	321.25	95.00	576.00	5.44
myrun_4	PSJF	336.25	101.00	600.00	226.38	321.25	95.00	576.00	5.44



As the number of process increases the waiting time increases as well

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# EXPERIMENT 2 HYPOTHESIS:

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NO DIFFERENCE IN RESULTS  
WHEN ALL DISTRIBUTION  
VALUES ARE FROM THE  
UNIFORM DISTRIBUTION

```
name myrun
comment This is experiment 1 run file
algorithm RR 2
```

```
numprocs 20
firstarrival 0.0
interarrival constant 0.0
duration uniform 20.0 80.0
cpuburst uniform 40.0 100.0
ioburst constant 0.0
basepriority 1.0
```

```
numprocs 20
firstarrival 0.0
interarrival constant 0.0
duration uniform 5.0 20.0
cpuburst uniform 10.0 25.0
ioburst constant 0.0
basepriority 1.0
```

```
logdir .
logfn logfile.html
quiet .
imagename gifim
user Local User
portable true
run myrun
exp myexp
```

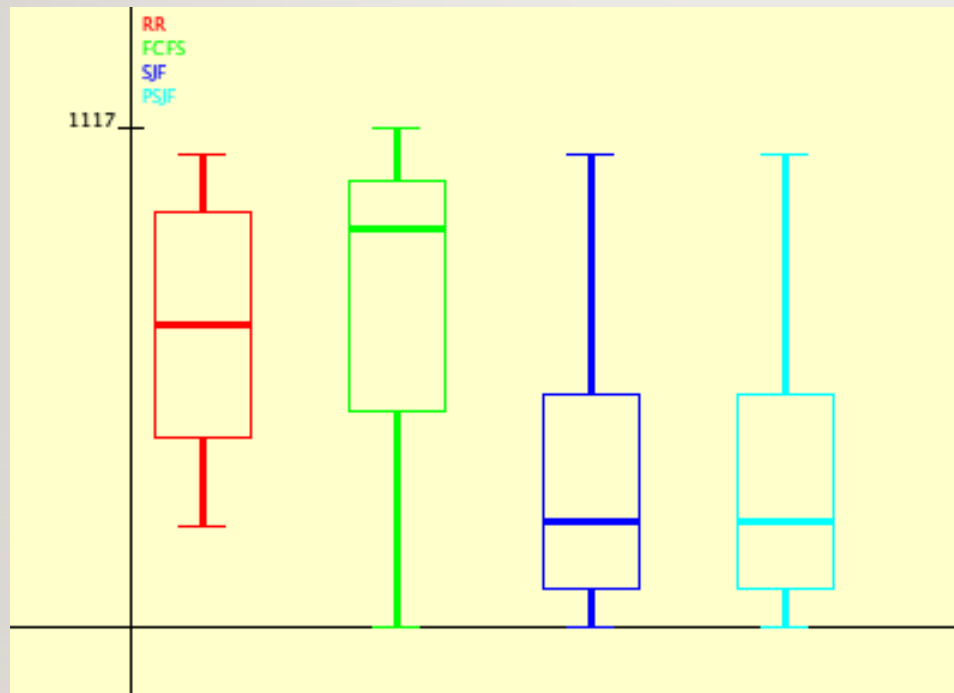


## 9 EXP FILE

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```
name myexp
comment This experiment contains 4 runs
run myrun algorithm RR 2 key "RR"
run myrun algorithm FCFS key "FCFS"
run myrun algorithm SJF key "SJF"
run myrun algorithm PSJF key "PSJF"
```

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## BOX PLOTS

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- Waiting time:
  - $FCFS > RR > SJF = PSJF$

Winners are SJF and PSJF

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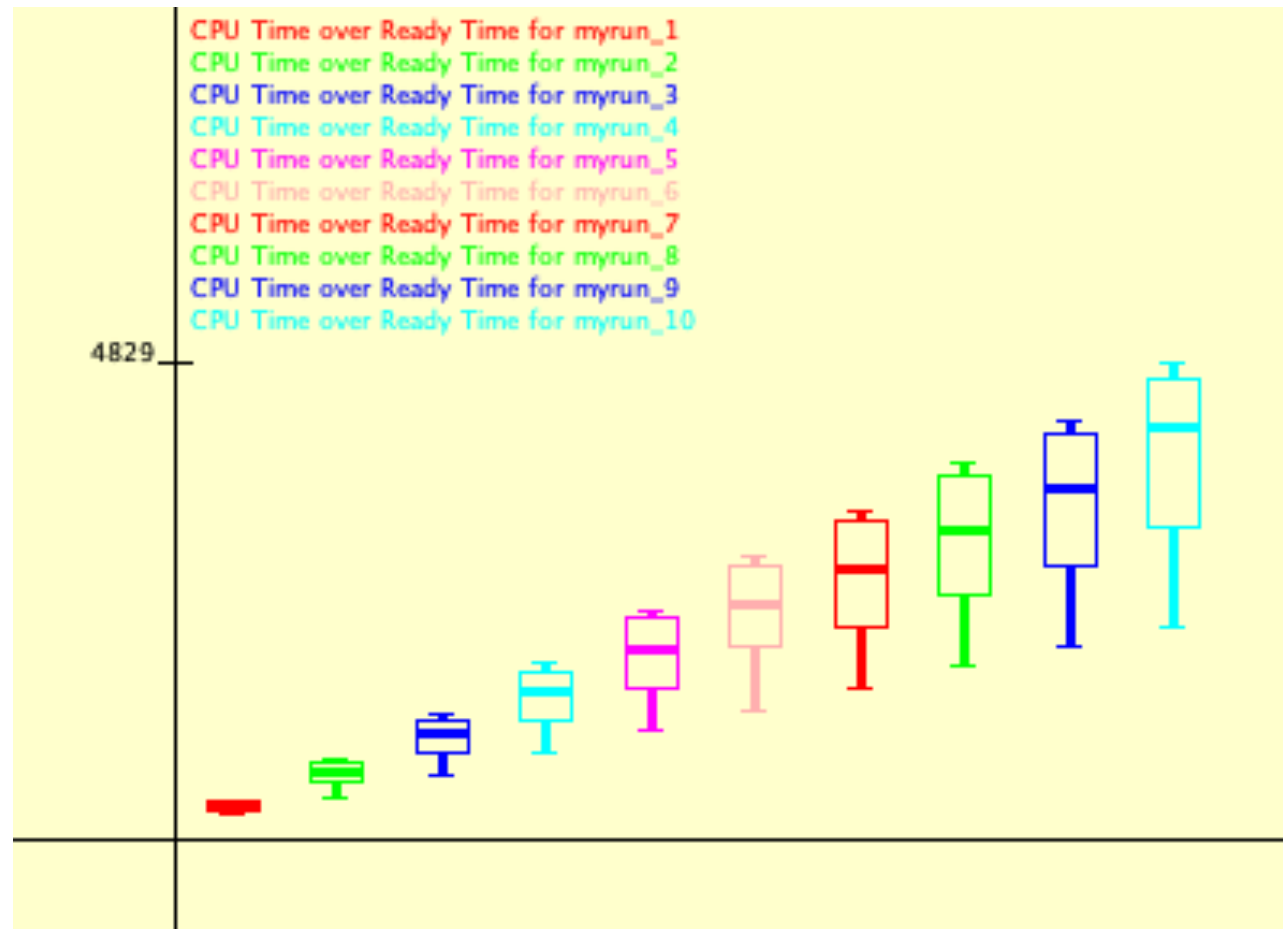
									Entries		Average Time	
Name	Key	Time	Processes	Finished	CPU Utilization	Throughput	CST	LA	CPU	I/O	CPU	I/O
myrun_1	RR	1132.82	40	40	1.00000	.035310	0.00	24.27	590	5	1.92	0.00
myrun_2	FCFS	1132.82	40	40	1.00000	.035310	0.00	26.14	45	5	25.17	0.00
myrun_3	SJF	1132.82	40	40	1.00000	.035310	0.00	11.93	45	5	25.17	0.00
myrun_4	PSJF	1132.82	40	40	1.00000	.035310	0.00	11.93	45	5	25.17	0.00

		Turnaround Time				Waiting Time			
Name	Key	Average	Minimum	Maximum	SD	Average	Minimum	Maximum	SD
myrun_1	RR	715.54	233.95	1132.82	282.30	687.22	228.00	1058.57	6.60
myrun_2	FCFS	768.65	64.42	1132.82	316.30	740.32	0.00	1117.41	8.14
myrun_3	SJF	366.16	5.95	1132.82	323.99	337.84	0.00	1056.64	7.62
myrun_4	PSJF	366.16	5.95	1132.82	323.99	337.84	0.00	1056.64	7.62

As the number of process increases the waiting time and the variance between the waiting time increases as well.

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# EXPERIMENT 3 HYPOTHESIS:

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NO DIFFERENCE IN RESULTS  
WHEN ALL DISTRIBUTION  
VALUES ARE FROM THE  
EXPONENTIAL DISTRIBUTION

```
name myrun
comment This is experiment 1 run file
algorithm RR 2
```

```
numprocs 20
firstarrival 0.0
interarrival constant 0.0
duration exponential 20.0
cpuburst exponential 40.0
ioburst constant 0.0
basepriority 1.0
```

```
numprocs 20
firstarrival 0.0
interarrival constant 0.0
duration exponential 5.0
cpuburst exponential 10.0
ioburst constant 0.0
basepriority 1.0
```

```
logdir .
logfn logfile.html
quiet .
imagename gifim
user Local User
portable true
run myrun
exp myexp
```

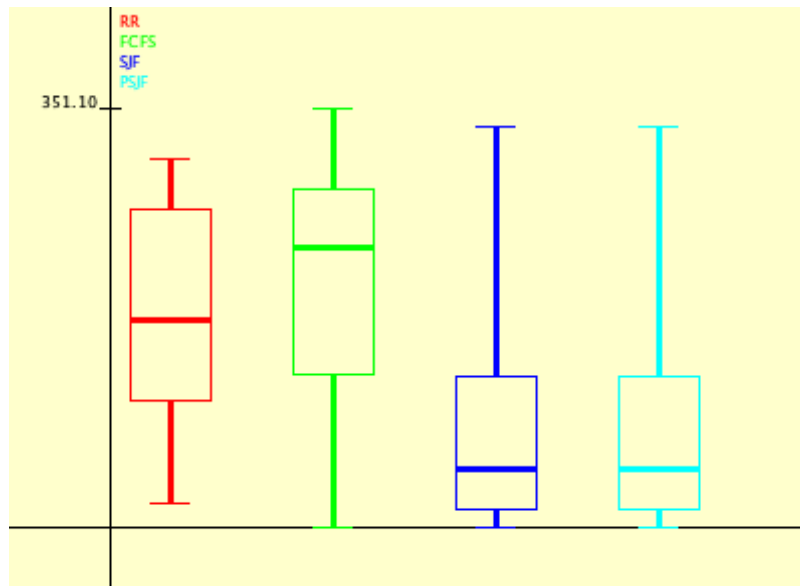
## 14 EXP FILE

---

```
name myexp
comment This experiment contains 4 runs
run myrun algorithm RR 2 key "RR"
run myrun algorithm FCFS key "FCFS"
run myrun algorithm SJF key "SJF"
run myrun algorithm PSJF key "PSJF"
```



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## BOX PLOTS

- Waiting time:
- $FCFS > RR > SJF = PSJF$

Winners are SJF and PSJF

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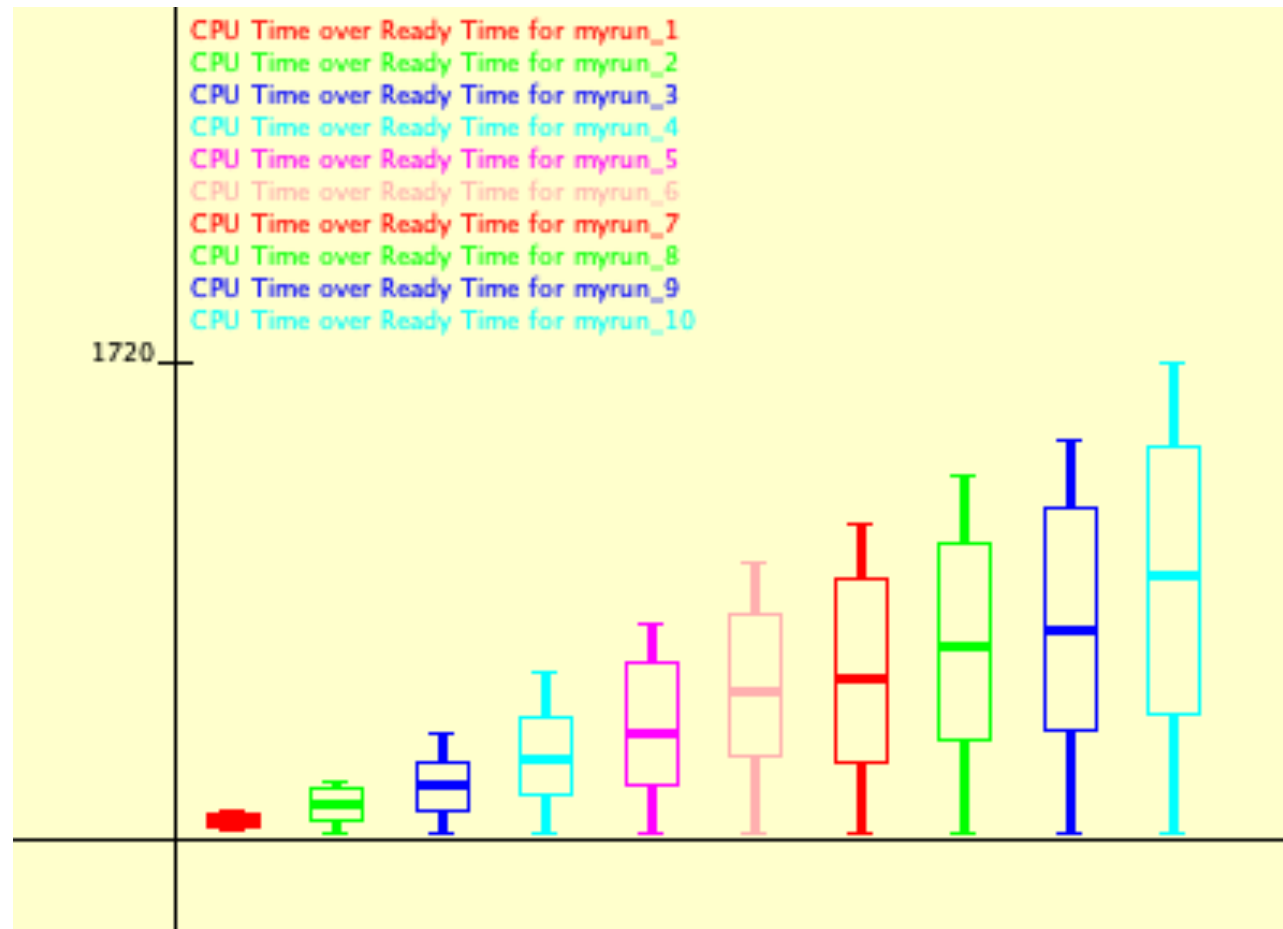
16									Entries		Average Time	
Name	Key	Time	Processes	Finished	CPU Utilization	Throughput	CST	LA	CPU	I/O	CPU	I/O
myrun_1	RR	363.55	40	40	1.00000	.110026	0.00	18.70	212	14	1.71	0.00
myrun_2	FCFS	363.55	40	40	1.00000	.110026	0.00	23.16	54	14	6.73	0.00
myrun_3	SJF	363.55	40	40	1.00000	.110026	0.00	9.29	56	16	6.49	0.00
myrun_4	PSJF	363.55	40	40	1.00000	.110026	0.00	9.29	56	16	6.49	0.00

		Turnaround Time				Waiting Time			
Name	Key	Average	Minimum	Maximum	SD	Average	Minimum	Maximum	SD
myrun_1	RR	179.04	20.68	363.55	97.91	169.95	20.00	309.36	2.24
myrun_2	FCFS	219.57	26.97	363.55	92.31	210.48	0.00	351.10	2.31
myrun_3	SJF	93.52	.33	363.55	99.04	84.43	0.00	336.58	2.25
myrun_4	PSJF	93.52	.33	363.55	99.04	84.43	0.00	336.58	2.25

As the number of process increases again we see an increase in the variance of waiting time and the waiting time itself.

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## 18 STRESS TESTING

Experiment 3:

1, 10, 100, 1000, and 10000 ran successfully.

100000, 1000000, 10000000, 100000000, and 1000000000 did not run successfully.

Experiment 1:

1, 10, 100, 1000, and 10000 ran successfully.

100000, 1000000, 10000000, 100000000, and 1000000000 did not run successfully.

Exception: `java.lang.OutOfMemoryError` thrown from the `UncaughtExceptionHandler` in thread "Thread-2"

No difference.

Number of processes	success 10/21/22
10	yes
100	yes
1000	yes
10000	yes
100000	yes
1000000	no
10000000	no
100000000	no
1000000000	no

# | 9 GHANTT CHARTS

